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**EMPIRICAL PAPER**

# Predictors of Returning to Work after Receiving Specialized Psycho-Oncological Care

Marije van der Lee\*, Adelita V. Ranchor†, Bert Garssen\*, Robbert Sanderma†, Maya J. Schroevers† and Corné Roelen†

**Objectives:** This study aimed to identify predictors of returning to work in a group of cancer patients that sought and received help from mental health care institutes specialized in psycho-oncological therapy. Moreover we identified which psychosocial factors were seen as important for returning to work by these patients and therapists working at these institutes.

**Method:** This naturalistic study focused on cancer patients who applied for help at specialized psycho-oncology institutions in the Netherlands. Data were collected before the start of psychological care (T1), and three (T2) and nine (T3) months thereafter. Predictors of return to work were identified based on the opinion of therapists and patients from psycho-oncology institutions in the Netherlands. Predictor scores at T1 were used to predict return to work at T3. Discrimination between patients with and without return to work at T3 was investigated with receiver operating characteristic (ROC) analysis and expressed as the area under the ROC curve (AUC).

**Results:** At T1, 174 participants (79%) were off work due to sickness and 119 (68%) had returned to work at T3. Therapists and patients identified psychological symptoms, quality of life, comorbidity, helplessness, acceptance, mastery, stressful life-events, well-being, and domestic and social functioning as being important for predicting return to work. Domestic functioning was the strongest predictor of return to work at T3. The prediction model including all identified predictor variables did not discriminate between patients with and without return to work at T3, with AUC = 0.652 (95% CI 0.553–0.751).

**Conclusions:** These results suggest that, although psychological symptoms are important at face validity for return to work after cancer, in patients that received help for psychological symptoms, they do not predict return to work.

**Keywords:** return to work; cancer patients; psychological care

## Introduction

Work is important to a large number of cancer patients, as 42% of patients diagnosed with cancer are of working age. Only two-third of cancer survivors return to work after having finished cancer treatment (Mehnert, 2011). From a patients' point of view, return to work is considered important for satisfaction, meaning, daily structure, social contacts, focus on other things than cancer and 'not being regarded as a patient' (Dutch Breast Cancer Federation, 2013). Returning to work following cancer is frequently experienced by patients as a sign of recovery (Kennedy, Haslam, Munir, & Pryce, 2007).

Individual differences have been found in the extent to which cancer survivors (do not) return to work (Van

Muijen et al., 2013). Research has examined which factors may explain these individual differences. A review from 2013 into predictors of return to work in cancer survivors included 28 articles and categorized predictors in socio-demographic, disease-related and job-related domains (Van Muijen et al., 2013). A limited number of predictors for not returning to work was found: the level of physical exertion, treatment with chemotherapy or invasive surgery, an older age, a lower education and lower income (Van Muijen et al., 2013). Intriguingly, no psychosocial factors like stressful life-events, well-being, psychological symptoms, quality of life, or acceptance were included in these 28 prognostic studies as potential predictors, while cancer certainly has an emotional impact on a group of patients, which in turn may influence return to work. A meta-analysis of 10,071 oncology patients across 14 countries showed a 38% prevalence of emotional disorder according to DSM or ICD criteria (Mitchell, Ferguson, Gill, Paul, & Symonds, 2013). Apart from one study (Spelten et al., 2003), we are not aware of any literature on the

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prognostic value of anxiety and depression for the return to work in cancer patients.

Several models are known that aim to integrate different predictors of return to work in order to understand the concept of return to work after cancer (de Boer, Frings-dresen, & Feuerstein, 2016; Feuerstein et al., 2010; Mehnert, de Boer, & Feuerstein, 2013). Feuerstein et al. (Feuerstein et al., 2010) proposed a 'cancer and work' model to conceptualize barriers for return to work, which considered both clinical and workplace application. The first category in this model is health and well-being, the second major category is the presence and severity of symptoms such as fatigue, depression and anxiety, followed by levels of daily functioning as the third major category in the model. They reviewed the literature and concluded that prospective studies are limited and there is a clear need for such studies in this area. Since there is little knowledge about which factors in the first, second and third category are most important for returning to work, we decided to start with a Delphi study. We obtained consensus information from a group of cancer patients with psychological symptoms and a group of therapists experienced in working with cancer patients ("the Delphi sample"). We asked them which factors they thought to be important predictors of return to work.

The predictors as elicited during the Delphi study will subsequently be used in a quantitative study, with the aim to examine a prediction model of return to work. We used data from a subsample of cancer patients from a previous study on the evaluation of the psychological care at specialized psycho-oncology centres (POC) in the Netherlands (Garssen et al., 2016) ("the evaluation sample"). Factors that were important for returning to work as reported by therapists and patients (i.e. the Delphi sample) were included in a multivariate prediction model for return to work after psychological treatment in the evaluation sample.

## Methods

### Study population

#### Evaluation sample

The POC evaluation study was a naturalistic study with consecutive sampling from all seven specialized psycho-oncology institutions in the Netherlands. Cancer patients that applied for psychological care on referral of their doctor between September 2008 and March 2010 were asked informed consent. For more details on participant recruitment procedure, see Garssen et al. (Garssen et al., 2016). Participants who consented to participate filled in questionnaires at intake (T1, N = 384), after 3 months (T2, N = 167) and 9 months (T3, N = 146). Eligible participants were: (1) diagnosed with cancer (any type) and seeking psycho-oncological help, (2) able to complete questionnaires in Dutch. In addition, for the current study they had to be (3) employed in paid work, and (4) sick-listed at the start of psycho-oncological therapy. Concerning ethical approval, in the Netherlands, studies evaluating institutional services are not subject to the Medical Research Involving Human Subjects Act and,

therefore, approval from a Medical Ethics Committee was not required. The POC evaluation study was approved by the institutional boards of all seven participating POCs.

#### Delphi sample

For the Delphi study we recruited two groups by purposive sampling: a group (n = 21; 61% women) of cancer patients with a mean age of 47.3 (SD = 14.7) years, and a group of therapists (n = 19; 79% women) aged 49.7 (SD = 11.4) years. Most patients and therapists at the Helen Dowling Institute received a paper questionnaire in their mailbox, all participants from other POCs filled out the questionnaire online via e-mail. Therapists were all working at one of the involved POCs and had substantial experience with psycho-oncological treatment.

#### Expert knowledge on predictor variables

We performed a Delphi study to obtain consensus on predictors for return to work. The Delphi process transforms personal opinions into group consensus (Hasson, Keeney, & McKenna, 2000; Sumsion, 1998). The Delphi participants scored the importance of all possible 20 variables for predicting work return at the end of treatment on a scale ranging from 0 (fully disagree) to 10 (fully agree) that were available from the evaluation sample. Variables were then selected for the prediction model if  $\geq 75\%$  of the participants rated the variable with a score  $\geq 7$  (Norder et al., 2012). This model was tested on data from the previous POC evaluation study, i.e. the evaluation sample (n = 384) (de Boer et al., 2016; Hasson et al., 2000; Norder et al., 2012).

#### Full disclosure

The POC evaluation study was used as described in Garssen et al. (Garssen et al., 2016). The dataset and questionnaires were added to this manuscript separately to provide full disclosure of used resources.

### Measures

Demographic and medical characteristics assessed in the evaluation sample

Demographic characteristics (age, gender, education, children at home, work hours/week, disability or employment benefits) and medical characteristics (date of cancer diagnosis, cancer site, cancer stage (metastatic no, yes), cancer treatment, health care utilization, and comorbidity) were measured at intake (T1). Health care utilization was assessed by questions on visits to general practitioners, use of medication in the past four weeks, and treatment by therapists (Trimbos and iMTA questionnaire on Costs associated with Psychiatric illness). Comorbid disease was investigated with an item asking for disorders other than cancer.

Psychosocial factors assessed in the evaluation sample

- Illness cognitions were measured with the Illness Cognitions Questionnaire, which contains subscales on helplessness, acceptance, and finding benefits in disease. Each subscale has 6 items and a score range of 6–24 (Evers et al., 2001).

- Mental health history was assessed by questions on previous psychological treatment (no, yes) and previous depressive episodes (no, yes).
- Fatigue was measured with the 8-item fatigue severity subscale of the Checklist Individual Strength (CIS) with a score range of 8–56. High scores reflect more severe fatigue (Beurskens et al., 2000).
- Anxiety was measured with the 6-item State-Trait Anxiety Inventory with a score range of 6–24 and higher scores reflecting more anxiety (Millar, Purushotham, McLatchie, George, & Murray, 2005).
- Depression was measured with the 16-item Center for Epidemiological Studies – Depression (CES-D) scale with a score range of 16–64 and higher scores reflecting a more depressed mood (Schroevers, Sanderman, van Sonderen, & Ranchor, 2000).
- Well-being was investigated with the 12-item 'Joy of Living' subscale of the Health and Disease Inventories (HDI). The subscale has a score range of 12–72 and higher scores reflected higher levels of well-being (de Bruin, van Dijk, & Duivenvoorden, 1996).
- Quality of life was measured with a single item asking how respondents would rate the quality of their life in the past four weeks on a scale ranging from 0 (very poor) to 10 (very good).
- Domestic and social functioning were investigated with the Groningen Social Behaviour Questionnaire (van der Lubbe, 1995). Domestic functioning was measured with 4 items (e.g., 'I could not do domestic tasks as usual') on a five-point Likert-type scale, range 4–20. Social functioning was measured with 8 items (e.g., 'I have contacted my friends less than usual') on a five-point Likert-type scale, amounting to a score between 8 and 40. Responses were recoded so that higher scores reflected better functioning.
- Finally, perceived control over situations and problems was measured with the 7-item Mastery scale, which has a score range of 7–35; higher scores reflect higher levels of experienced mastery (Pearlin & Schooler, 1978).

### **Prediction model**

After selection by the Delphi participants, predictor variables were included in a multivariate logistic regression model with return to work nine months after treatment (no = 0, yes = 1) as outcome variable. The logistic regression equation was then applied to predict the probability of return to work for each patient. The predicted probabilities were compared to the observed probability of return to work by using the Hosmer-Lemeshow (H-L) goodness of fit test (Steyerberg, 2009; Steyerberg et al., 2010). A non-significant ( $p > .05$ ) H-L test result means that predicted probabilities do not deviate significantly from the observed probabilities. Thus, a non-significant H-L test result indicates that the prediction model adequately predicts return to work after treatment.

We wanted to investigate the prediction model as a prognostic tool for return to work after treatment. For this purpose, we must know whether the prediction model discriminates between patients with and without return to work after treatment. Therefore, the probabilities predicted by the logistic regression model were included in receiver operating characteristic (ROC) analysis. ROC analysis addresses each probability as a cutoff point and estimates the proportion of patients with return to work having a predicted probability higher than the cutoff point (sensitivity) and the proportion of patients without return to work having a predicted probability lower than the cutoff point (specificity). The ROC-curve plots sensitivity (on the y-axis) against 1-specificity (on the x-axis). The area under the ROC-curve (AUC) is a measure for discrimination between patients with and without return to work after treatment (Steyerberg, 2009). An AUC 0.9–1.0 represents excellent, 0.8–0.9 good, 0.7–0.8 fair, 0.7–0.6 poor, and <0.6 failing discrimination. For example, an AUC = 0.75 indicates that the prediction model will correctly discriminate between patients with and without return to work in 75% of the cases.

Discrimination will be different in other samples of cancer patients, because the prediction model is based on a logistic regression equation fitted to the data of the patients in the study population. To get an idea of the prediction model's discriminative ability in other samples of cancer patients, we used bootstrapping. This data simulation technique creates bootstrap samples by randomly drawing patients from the study population. Patients are randomly drawn with replacement, and therefore some can be drawn into a bootstrap sample twice or more frequently while other patients may not be drawn. Consequently, each bootstrap sample has a different data structure (Steyerberg, 2009; Steyerberg et al., 2001, 2010). In the present study, 250 bootstrap samples were drawn to validate the prediction model's discrimination. The validated AUC represents discrimination that can be expected in other samples of cancer patients and thus increases the external validity of the study results.

### **Software**

The prediction model was developed with IBM SPSS Statistics for Windows, version 20.0 (IBM Corp., 2012) and validated in R (R Core Team, 2017) by using Harrell's Regression Modeling Strategies (rms) package, version 3.2-0 (Harrell Jr, 2013).

## **Results**

### **Delphi study: selection of predictor variables**

Overall differences were small between therapists and patients, though patients valued domestic and social functioning, well-being and stressful life-events more important as predictors of return to work at T3, than therapists (**Table 1**).

Using the Delphi approach, consensus (i.e. >75% of both patients and therapists rated as important >7) was reached on the importance of 12 predictor variables.

**Table 1:** Delphi Study Results.

Variable	Total (N = 40)	Patients (n = 21)	Therapists (n = 19)	Difference
<b>Depressive symptoms</b>	<b>9.00 (8.00–9.00)</b>	9.00 (8.00–9.00)	8.00 (8.00–9.25)	P = 0.669
<b>Fatigue</b>	<b>9.00 (8.00–9.00)</b>	9.00 (8.00–9.00)	9.00 (8.00–10.00)	P = 0.667
<b>Anxiety</b>	<b>8.00 (8.00–9.00)</b>	9.00 (8.00–9.00)	8.00 (7.75–9.00)	P = 0.499
<b>Quality of life</b>	<b>8.00 (8.00–9.00)</b>	8.00 (8.00–9.00)	8.00 (6.00–8.00)	P = 0.168
<b>Well-being</b>	<b>8.00 (8.00–9.00)</b>	9.00 (8.00–9.00)	8.00 (7.00–9.00)	P = 0.043
<b>Social functioning</b>	<b>8.00 (8.00–9.00)</b>	8.50 (8.00–9.00)	7.00 (6.00–9.00)	P = 0.036
<b>Comorbidity</b>	<b>8.00 (7.00–9.00)</b>	8.00 (7.00–9.00)	8.00 (7.00–9.00)	P = 0.934
<b>Disease cognitions</b>				
<b>helplessness</b>	<b>8.00 (7.00–9.00)</b>	8.00 (7.00–9.00)	8.00 (7.00–9.00)	P = 0.911
<b>acceptation</b>	<b>8.00 (7.00–9.00)</b>	9.00 (7.00–9.00)	8.00 (7.00–9.00)	P = 0.341
<b>Mastery</b>	<b>8.00 (7.00–9.00)</b>	8.00 (7.00–9.00)	9.00 (8.00–9.00)	P = 0.500
<b>Stressful life-events</b>	<b>8.00 (7.00–9.00)</b>	8.00 (8.00–9.00)	8.00 (7.00–8.00)	P = 0.042
<b>Domestic functioning</b>	<b>8.00 (7.00–9.00)</b>	8.00 (8.00–9.00)	7.00 (6.00–8.00)	P = 0.023
Attitude spouse				
motivating	7.00 (6.00–8.00)	8.00 (3.50–8.50)	7.00 (6.00–8.00)	P = 0.510
protective	7.00 (6.00–8.00)	8.00 (5.00–8.00)	7.00 (6.00–8.00)	P = 0.537
Use of medication				
analgesics	7.00 (6.00–8.00)	7.00 (6.00–8.00)	6.00 (5.00–8.00)	P = 0.375
tranquilizers	7.00 (5.75–8.00)	7.00 (4.25–8.00)	7.00 (6.00–8.00)	P = 0.806
sedatives	7.00 (5.75–8.00)	7.00 (5.25–8.75)	7.00 (5.75–8.00)	P = 0.613
antidepressants	6.50 (4.00–8.00)	7.00 (3.25–8.00)	6.00 (4.75–8.25)	P = 0.740
Age	7.00 (5.00–8.00)	7.00 (5.50–9.00)	5.00 (4.00–8.00)	P = 0.101
Children at home	6.50 (4.25–7.75)	7.00 (5.00–8.50)	6.00 (3.00–7.00)	P = 0.052
Therapeutic sessions				
number	6.00 (5.00–8.00)	7.00 (5.00–8.00)	6.00 (5.00–7.00)	P = 0.210
frequency	6.00 (5.00–8.00)	7.00 (4.00–8.00)	5.00 (5.00–6.00)	P = 0.134
type (individual or group)	6.00 (2.50–8.00)	7.00 (2.00–8.00)	5.50 (2.75–7.00)	P = 0.558
Time since diagnosis	6.00 (4.00–8.00)	6.00 (4.00–8.00)	6.00 (4.00–8.00)	P = 0.773
Previous psychological treatments	6.00 (4.25–7.00)	7.00 (4.00–8.00)	5.00 (5.00–7.00)	P = 0.245
Education	6.00 (2.00–8.00)	7.00 (2.50–8.00)	5.00 (2.00–7.00)	P = 0.293
Treatment by other therapists	5.00 (2.00–7.00)	6.00 (2.00–7.00)	5.00 (3.00–7.00)	P = 0.966

*Note:* The table shows median (25th percentile–75th percentile) scores for potential predictors of sickness absence nine months after intake and the difference in opinion between patients and therapists (Mann-Whitney U-test); bold font indicates group consensus, which is achieved when >75% of both groups, patients and therapists, rated the variable as important >7). In the final column p-values are reported on the difference between therapist and patient scores.

Earlier analyses showed considerable co-occurrence of depression, anxiety and fatigue in this group of patients (Zhu et al., 2016). Therefore, these three variables were merged into one category, that is, psychological symptoms. As a result, 10 variables were selected for the prediction model: psychological symptoms, quality of life, comorbidity, helplessness, acceptance, mastery, stressful life-events, well-being, domestic functioning, and social functioning.

#### **Prediction model development**

At intake, 219 of 384 study participants were employed in a paid job, of whom 174 (79%) were sick-listed at the start of therapy. The data of these 174 participants were used to develop the model for predicting return to work at T3. At T3 119 (68%) of these patients did no longer report sickness absence from work. **Table 2** shows the characteristics of the participants (166 women and 53 men). Their mean age was 48.7 (SD = 8.6) years and they worked



**Table 2:** Study Population Characteristics.

	Mean (SD)	n (%)
Cancer diagnosis		
breast		109 (50)
leukemia/lymphoma		24 (11)
gastrointestinal		20 (9)
head/neck		17 (8)
lung		14 (6)
gynaecologic		12 (5)
other		23 (11)
Metastatic		77 (36)
Years since diagnosis	2.3 (4.1)	
Years since end of treatment	1.0 (2.6)	
Still under treatment		99 (45)
Illness cognitions		
helpless (range 6–24)	12.8 (4.0)	
acceptance (range 6–24)	13.0 (3.7)	
finding benefits (range 6–24)	13.8 (4.2)	
Use of medication		
analgetics		84 (38)
tranquilizers		35 (16)
sedatives		47 (22)
anidepressants		15 (7)
Previous psychologic treatment		
no		126 (58)
yes		93 (42)
Fatigue (range 8–56)	35.5 (11.9)	
Anxiety (range 6–24)	14.4 (3.5)	
Depressive symptoms (range 0–48)	15.0 (8.6)	
Well-being (range 0–10)	6.0 (1.6)	
Mastery (range 7–35)	21.2 (4.7)	
Domestic functioning (range 4–20)	10.2 (3.7)	
Social functioning (range 8–40)	20.1 (7.3)	
Life-events past year		
0		56 (26)
1		74 (34)
2		43 (20)
3 or more		46 (21)

Note: (N = 219).

on average 29.0 (SD = 9.8) hours per week. Most of them had secondary vocational (24%), higher vocational (37%), or academic education (18%). Forty-six participants reported comorbid disease, particularly pulmonary (9%), neurologic (migraine 9% epilepsy 1%), gastrointestinal (5%) and endocrine (thyroid 4%, diabetes 2%) disorders.

None of the predictor variables valued important by patients and therapists in the Delphi procedure was significantly associated with return to work (Table 3). The multivariate logistic regression model including the variables selected by the Delphi panel explained 10% of the variance in return to work.

### Prediction model performance

The H-L test p-values was 0.41, which was non-significant. This indicated that the prediction model adequately predicted the probability of return to work. The validated AUC was 0.652 (95% CI 0.553–0.751), which means that the prediction model correctly discriminated between cancer patients with and without return to work in 65.2% of the cases. Although significantly better than discrimination by chance (i.e., AUC = 0.50), discrimination of this magnitude is poor (Figure 1) and not sufficient to use the prediction model as a prognostic tool for return to work after treatment (Figure 1).

### Conclusion

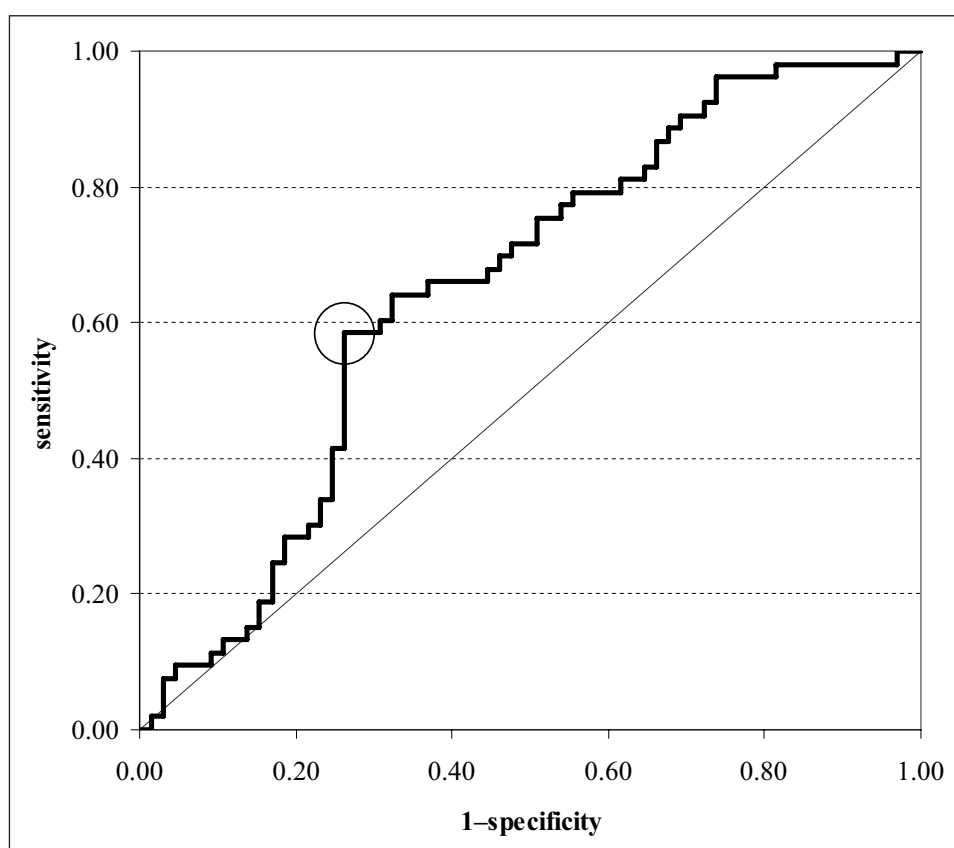
Using a Delphi approach, cancer patients who sought treatment for psychological symptoms and therapists offering psycho-oncological treatment agreed that the following factors were important for (not) returning to work: comorbidity, psychological symptoms (anxiety, depression and fatigue), well-being, quality of life, helplessness, acceptance, mastery, stressful life-events, domestic and social functioning. This is in line with the proposed Cancer and Work model in which well-being, psychological symptoms, fatigue, and functioning are considered most important for working with cancer (Feuerstein et al., 2010). Using data from a large national study in cancer patients in which psychological treatment was evaluated, results from multivariate analyses including the predictors identified by the Delphi participants showed that none of the predictors was significantly associated with return to work after nine months of receiving psychological treatment.

We found that, although patients and therapists agreed that factors like well-being, psychological symptoms, fatigue, and functioning are important for returning to work, none of the identified predictors was significantly associated with return to work after nine months. It might be that predictors for returning to work differ too much between patients, so that for one individual patient well-being may play a role, but not for the whole group of patients. This would imply that it is not feasible to make a prediction model for all patients at baseline. Another explanation may be that there was not enough variance in predictors at baseline (i.e. start of psychological treatment): the level of psychological symptoms for example was high for most patients. If we had analyzed data over a longer period of time and assuming that the level of psychological symptoms diminishes in a group of patients, this might have taught us more about the predictive value of psychological symptoms for returning to work in the longer term. However, the scope of the current study was to identify predictors of return to work among cancer

**Table 3:** Prediction Model Development.

	B (SE)	Wald	OR (95% CI)	p-value
Intercept	-4.501 (2.881)			
Psychological symptoms	0.008 (0.018)	0.177	1.008 (0.972–1.045)	P = 0.674
Quality of life	-0.300 (0.190)	2.507	0.741 (0.510–1.075)	P = 0.113
Comorbidity	0.136 (0.486)	0.078	1.145 (0.442–2.970)	P = 0.780
Helplessness	0.086 (0.068)	1.615	1.090 (0.954–1.245)	P = 0.204
Acceptation	0.008 (0.064)	0.014	1.008 (0.890–1.141)	P = 0.905
Mastery	-0.062 (0.050)	1.563	0.940 (0.852–1.037)	P = 0.211
Stressful life-events	0.149 (0.127)	1.375	1.161 (0.905–1.489)	P = 0.241
Well-being	-0.020 (0.037)	0.283	0.981 (0.913–1.054)	P = 0.594
Domestic functioning	-0.109 (0.058)	3.463	0.897 (0.800–1.005)	P = 0.063
Social functioning	-0.024 (0.034)	0.509	0.976 (0.914–1.043)	P = 0.475

*Note:* The table shows regression coefficients (B) and related standard errors (SE), Wald-statistics ( $[B/SE]^2$ ), odds ratios (OR) and related 95% confidence intervals (CI), and significance of associations between predictor variables and sickness absence nine months after intake.



**Figure 1:** Discrimination graph. The figure shows the receiver operating characteristic (ROC) curve. Discrimination improves with the area under the ROC curve; the diagonal indicates no discrimination above chance. the circle denotes a 49% cut-off risk with sensitivity 0.59 and specificity 0.74.

patients, based on patients' characteristics at the start of psycho-oncological therapy.

Studies have found that about 64% of cancer survivors return to work (with a wide range between 24% and 94%), and that returning to work is more difficult for patients with advanced stages and/or more intensive cancer treatment (Mehnert et al., 2013). The 68% return to work rate found in the present study is in line with these findings,

even though 36% of the patients had advanced stage cancer and most patients had clinical levels of depression and/or anxiety and/or fatigue at baseline. This might indicate that the study included cancer patients who were very eager to resume work.

Quantitative studies showed that fatigue, anxiety and depressed mood often co-occur (Zhu et al., 2016), because these symptoms are causally related (Cramer, Waldorp,

van der Maas, & Borsboom, 2010). We therefore merged the scores on depression, anxiety and fatigue into one variable 'psychological symptoms', to reduce the number of predictor variables and limit the risk of statistical overfitting. It would be interesting in future studies to differentiate between these symptoms when analyzing the effects on return to work. In addition, it would be important to know whether patients acknowledge fatigue, anxiety, depression equally important as a reason not to go back to work, or that for instance fatigue is more considered to be a legitimate reason.

The strength of our study lies in the fact that we used the knowledge of experts (both cancer patients and therapists) and focused on the role of psychosocial factors in predicting return to work, which have not been studied before among cancer patients who applied for psycho-oncological treatment. Several limitations need to be considered when interpreting the findings of this study. The most important limitation of this study is that we used a small sample of cancer patients, which restricted the statistical power of the multivariate analyses. The limited power may be a reason that none of the 10 predictors in the prediction model was found to be significant. Predictions by models developed in small samples are difficult to generalize to other populations of cancer patients. Therefore, predictions were internally validated in 250 bootstrap samples (Steyerberg et al., 2001). The validated AUC presented in this study is indicative of the discrimination that can be expected when the prediction model is applied to new samples of cancer patients. Another limitation was that we assessed return to work by asking about sickness absence in the past four weeks. It is known that this is a time period that most people can reliably remember. It is possible, however, that a patient did resume work during therapy, but got sick again the month before T3. Furthermore, information on causes of sickness absence at the end of treatment was not available from the POC evaluation study. Future studies should gather information on sickness absence during the whole period of treatment.

In sum, the current study showed that though patients and therapists identified multiple predictors for return to work as important, none of these predictors were significantly associated with return to work. Moreover, a prediction model which correctly discriminated between cancer patients with and without return to work, did not sufficiently discriminate in order to use the prediction model as a prognostic tool for return to work after treatment. Following patients for a longer time before and after treatment could teach us more about the predictive value of psychological symptoms for returning to work in the longer term.

### Additional Files

The additional files for this article can be found as follows:

- **Analysis and output.** Output analyse Corne Roelen Marije van der Lee Return to work. DOI: <https://doi.org/10.5334/hpb.4.s1>
- **Data file delphi study.** Databestand werkhervatting. DOI: <https://doi.org/10.5334/hpb.4.s2>

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### Competing Interests

The authors have no competing interests to declare.

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